

The Canadian Entomologist.

LXXVII

JUNE, 1945

No. 6

NEW NORTH AMERICAN GEOMETRIDAE WITH NOTES, IV*

BY J. McDUNNOUGH,
Ottawa, Ont.

LARENTIINAE

Xanthorhoe marinensis n. sp.

Allied to *pontiaria* Tayl. in male genitalia but the numerous teeth along the chitimized costa of the clasper much smaller; the strong excavation of this section found in *pontiaria* is much reduced in the present species and the membranous portion of the clasper is subequal in length to that of the chitimized area and not considerably shorter. The whole genitalia are noticeably smaller.

Wing pattern of primaries much as in *pontiaria* but the color of the median band a paler, washed-out brown. In the male the crenulate lines of the subterminal area are distinct and there is no trace of a dark terminal shade below the wing-apex; this shade is, however, present in the female. Hind wings very pale creamy with little trace of maculation in the basal two-thirds of the wing; two faint, fine, subterminal, dark lines are present and the terminal area is shaded with smoky. Beneath with obsolescent maculation. Expanse 21-23 mm.

Holotype—♂, Inverness, Marin Co., Calif., 30.IV.1940 (E. C. Johnston); No. 5566 in the Canadian National Collection, Ottawa.

Allotype—♀, same data, 31.V.1938.

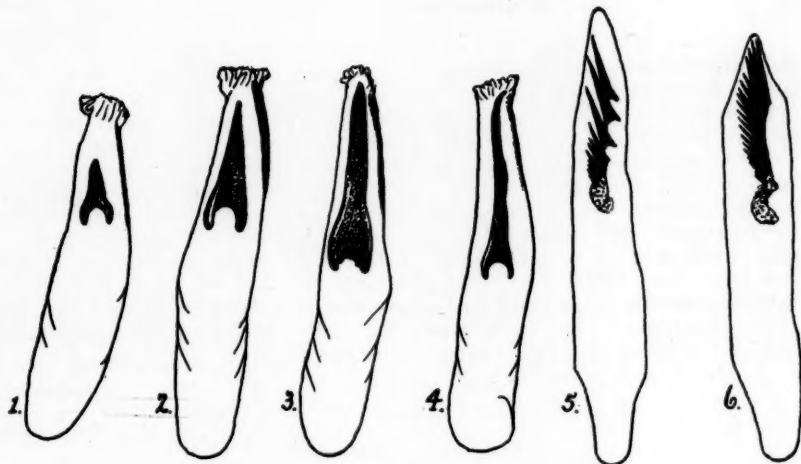
ENNOMINAE

Vinemina opacaria Hlšt.

In checking over the male genitalia of considerable material from various localities in the southwestern States—largely received through the courtesy of Mr. J. L. Sperry—and which had all been included under the name *opacaria* Hlšt., I was surprised to find considerable divergence in the armature of the vesica, although in other respects the organs appeared practically identical. These differences held constant in slides made from series from any given locality but, try as I would, I could find no satisfactory and constant characters of maculation which could be used in support of the genitalic differences to indicate specific distinctness. Hulst based his name on four specimens from 'Colorado' (no definite locality given) and the type in his collection is unfortunately a female; the whereabouts of the other specimens is unknown to me. On a recent visit to New Brunswick, N. J., Mr. T. N. Freeman took some of the above-mentioned material along with him for a careful check-up on the type and he was able to match it very closely with a male specimen from the vicinity of Taos, N. Mex., a locality very near the southern border of Colorado. There are two male specimens from this locality before me, taken by the Sperrys on July 1, 1935, and I find that in the armature of the vesica they agree with one another but differ from the figure given in my 1920, Cleorini Revision (Pl. I, fig. 9) which was based on a specimen from Paradise, Cochise Co., Ariz., and in which the large, broad pointed spine which occupies the apical two-fifths of the aedeagus is very clearly visible. In the Taos specimens this spine is much reduced, being hardly half the size of that found in the Arizona specimen. I propose to consider these Taos specimens as typical *opacaria* and would point out that in the maculation of the primaries the pale band between the rather obscurely

*Contribution No. 2334, Division of Entomology, Science Service, Department of Agriculture, Ottawa.

irregular t. a. line and the inner margin of the dark median shade is quite broad. In my Arizona specimens (5 ♂, White Mts. region; 3 ♂, Paradise) there is a decided tendency for this same band to narrow very considerably above the inner margin, due to the more oblique nature of the t. a. line; this character is recognizable in the figure in my revision (Pl. VII, fig. 17) but, unfortunately, is not entirely constant. Five specimens from Beaver, Utah (July 9, 10, 1937; July 13, 14, 1938) show the same narrowing of the antemedian band but in these (as far as examined) the spine in the vesica is still longer, occupying fully the apical half of the aedeagus.



Aedeagus of *Vinemina opacaria* 1. from Taos, New Mex. (typical); 2. from White Mts. Ariz.; 3. from Beaver, Utah.

4. Aedeagus of *V. catalina* n. sp., Holotype.

5. Aedeagus of *Galenara lixaria* Grt.

6. Aedeagus of *Galenara lixarioides* n. sp.

At the present time I do not feel justified in naming any of these forms but figure the differences of genitalia in the hopes that some one, more fortunately situated than I am for securing additional material, may become interested in solving the problem as to whether such differences constitute specific distinctness or not. It might be mentioned that in *nigaria* Cass. from Alpine, Tex., of which we possess a male paratype, the size of the spine in the vesica is similar to that of the Arizona material; although based on a very heavily suffused form this varietal name may have to be raised to specific rank.

Finally I venture to describe as new another form which can be separated from the above-mentioned ones on both characters of maculation and genitalia.

Vinemina catalina n. sp.

Similar in color and maculation to *opacaria* but the median shade instead of being gently rounded is *sharply angled outwardly* on the cubital vein. In the male genitalia the spine in the vesica is *long and much thinner* than in the *opacaria* form from Utah. Expanse 30 mm.

Holotype—♂, Sta. Catalina Mts., Ariz., July 20, 1938 (O. Bryant); No. 5569 in the Canadian National Collection, Ottawa.

Paratype—1 ♂, same data.

Galenara lixaria Grt.

Apparently two very closely allied species—as far as maculation is concerned—have been confused under this name. In the one instance we have a large species, almost equal in size to *lallata* Hlst., with a long, distinct groove on the inner side of the male hind tibia containing a strong hair-pencil composed of very long hairs. In the second instance we have a somewhat smaller species with no indication of either groove or hair-pencil on the male hind tibia, although a few long scales occur at the base of the joint which might at first sight be confused with an incipient pencil. The genitalia, while in general quite similar, show a character in the arrangement of the cornuti in the aedeagus which appears specific. In the species with hair-pencil the cornuti are comparatively few in number and are arranged in a longitudinal row with the cornuti increasing markedly in size from base to apex; the terminal three or four are quite stout and well-separated from one another. In the other species the cornuti are thinner and much more numerous and tend to spread out in a fan-shaped manner toward the apex. These differences are illustrated in my present figures, the second form being also figured as *lixaria* in my Cleorini Revision (1920, Bull. 18, Dom. Dept. Agr., 15, Pl. II, fig. 3).

As far as can be ascertained the true *lixaria* Grt. is the large species with the hair-pencil in the male. Unfortunately the type, in the United States National Museum, is lacking both abdomen and hind legs; however, according to information kindly furnished by Mr. H. Capps, both the specimen figured as *lixaria* in the B. & McD. 'Contributions' (1916, Vol. III (3), 184, Pl. XIII, fig. 11) and another male which I had years ago compared with the type while in the Neumoegen Collection at Brooklyn, show this hair-pencil, and I believe, therefore, that I am justified in considering such specimens as typical of *lixaria* Grt. My material is mostly from the White Mts., Ariz. (June) but there are females before me from the Ste. Catalina Mts., Ariz., also captured in June, an undated female from Redington, Ariz., and a single male from Oak Creek, Ariz., taken in September.

For the second species, which was erroneously placed as *lixaria* in my revision, the following name is proposed.

Galenara lixarioides n. sp.

Differs principally from *lixaria* in the structural details mentioned above. Size in general somewhat smaller than *lixaria*. Color and maculation practically identical with that of *lixaria*, so close, indeed, that it seems impossible to point to any single character whereby the two species can be definitely separated. It might be noted that on the primaries the angle of the dark median shade in the cell is generally more open and less acute than in *lixaria* and somewhat less diffuse; there is little of the brownish shades beyond the t. p. line found frequently in *lixaria* (especially females) and this line shows a somewhat stronger outward bend at inner margin than is normally the case in *lixaria*; the pale s. t. line is only feebly indicated but on the other hand its dark inward border is quite conspicuous and forms a continuous line. On the secondaries the discal spot is rather stronger than that found in *lixaria*. All these characters are, however, not entirely constant. Expanse 32-35 mm.

Holotype—♂, Ste. Catalina Mts., Ariz., Aug. 20, 1938 (O. Bryant); No. 5585 in the Canadian National Collection, Ottawa.

Allotype—♂, same data, Aug. 15.

Paratypes—4 ♂, same data as holotype and allotype.

Stenoporpia insipidaria n. sp.

Palpi short, smoky. Front smoky with a white transverse line along posterior margin in front of antennae. Thorax and abdomen clothed with an admixture of whitish and purplish-brown scaling, the latter crossed by narrow

black bands along anterior margins of segments. Primaries grayish-white, sprinkled with smoky, considerably more so in female than in male, and crossed by two prominent, inwardly oblique, dark lines (the t. a. and t. p.), rather closely approached in lower half of wing and—except at costa—with no prominent in- or outcurves. T. a. line a fine dark line, only extending between cell and inner margin at $\frac{1}{4}$ but preceded by a rather broad, suffused, dark shade, which shows a very strong inward bend between cell and costa. T. p. a broader dark line from middle of inner margin, directed obliquely toward apex of wing but fading at vein 6 where it bends sharply inward to costa and is obsolescent. The enclosed median space is the palest portion of the wing and contains a prominent dark discal spot which tends to become a ringlet; there is also a trace of a fine median hair-line, paralleling the t. p. line and running either through or just outside the discal spot. The t. p. line is bordered outwardly by a fine, whitish line and beyond this is a moderately broad band of quite light brown; this, in turn, is bordered outwardly by a whitish area, narrow below costa but broadening in lower half of wing. The terminal area is shaded with smoky through which a well-defined, crenulate, white, s. t. line runs. A terminal black line and grayish fringes. Secondaries with outer margin feebly crenulate, similar in color and maculation to primaries except that the t. a. line is lacking and its place is taken by an oblique median line, fading toward costa; the s. t. line is rather less crenulate than on primaries. Beneath pale silky grayish. Expanse 28-30 mm.

Male Genitalia. Closest to those of *anellula* B. & McD. and *macdunnoughi* Sperry. The tegumen is rather narrow with a moderately broad hood-like uncus, terminating in two short points. A well-developed gnathos is present, the two arms uniting to form a narrow, spiculate and pointed apical section. Clasper narrow and obliquely truncate apically, the chitinized costa notched beyond $\frac{1}{2}$ and rather bluntly truncate at its apex which is furnished with two spines of which the ventral one is the longer and somewhat curved. Aedeagus long and thin with pointed apex.

Holotype—♂, Jemez Spgs., N. Mex. (date obscured); No. 5604 in the Canadian National Collection, Ottawa.

Allotype—♀, same locality, Aug. 18, 1914 in Cambridge Museum of Comparative Zoology.

Paratypes—1 ♂, same locality (Aug.) in Cambridge Museum of Comparative Zoology; 3 ♀, Jemez Spgs., N. Mex. (J. Woodgate) July 8, 24, 29 (the latter captured at 6000 ft.) in Canadian National Collection, Ottawa.

Stenoporpia anellula B. & McD.

In checking over our material in the genus *Stenoporpia* I find that the genitalia figured in my 1920 Cleorini revision as those of this species really belong to the more recently described *macdunnoughi* Sperry; the slide was made from a poor specimen from Denver, Colo., now in our Collection. A reference to the correct genitalic figure given in the B. & McD. 'Contributions' III, Pl. XXXI, fig. 1, shows that the uncus of *anellula* is broader and less produced apically, the clasper much longer and with a less pronounced notch on costa near apex. The true species is now represented in our collection by a male from Sta. Catalina Mts., Ariz., the genitalia of which match the figure in the 'Contributions' excellently. The maculation of the two species is very similar but *anellula* is much deeper in color with none of the bright brown shading so characteristic of *macdunnoughi*.

Stenoporpia glaucomarginaria n. sp.

Allied to *vernaella* McD. but somewhat more contrastingly marked and slightly larger.

Thorax blackish, slightly peppered with pale scaling. Primaries with

the pale whitish ground-color heavily suffused with blackish shading and sprinkling but with a *prominent broad pale ochreous area* extending above inner margin from near base to s. t. line, such a shade being merely faintly indicated in *vernalella* and *purpuraria*. T. a. line fine, blackish, strongly outcurved below costa, then inwardly oblique; it is preceded by a broad, smoky shade which changes to a *light brown color* when crossing the pale area at inner margin; area basad of t. a. line largely deep smoky. Median area paler, with considerable whitish suffusion; a small smoky discal dash (not ringlet), preceded on costa, nearer base, by a smoky patch. T. p. line fine, black, irregularly outwardly oblique from costa to vein 5 with a slight outward tooth on vein 6; then inwardly oblique, slightly sinuate but without the prominent incurve above inner margin found in *vernalella*. It is followed by a broad bicolored shade, light brown along vein 6, between veins 3 and 4 and *especially across the pale area* of inner margin, otherwise deep smoky, particularly at costa. S. t. line white, quite prominent, especially between veins 3 and 4, slightly irregular but not noticeably crenulate, bordered inwardly by a smoky shade. Terminal area largely shaded with smoky. Fringes pale smoky. Secondaries with feebly crenulate outer margin, heavily sprinkled with smoky and crossed by a smoky antemedian line, a slightly irregular, dark, postmedian line, in general parallel to outer margin, and a rather straight, whitish s. t. line. The postmedian line is followed first by a broad brown shade, somewhat suffused with smoky, and then by a narrow whitish area which separates the brown band from a deep smoky one, bordering the s. t. line inwardly. Discal dot small, punctiform. Beneath pale silky with slight dark preapical shade. Expanse 36 mm.

In the male genitalia the tip of the uncus is much broader than in *vernalella* and similar to that of *graciella* McD., with the lateral edges evenly sloping and their apices produced into sharp points; the gnathos is rudimentary. The chitinated costal area of the clasper is sharply notched at one-third before apex and the narrow truncate apex is armed with 3-4 small subequal spines. The vinculum is squarely cut apically.

Holotype—♂, Arizona (O. Bryant) (possibly White Mts.); No. 5568 in the Canadian National Collection, Ottawa.

Paratypes—1 ♂, Alpine, Ariz., 18.VI.36 (J. & G. Sperry); 2 ♂, White Mts., N. M., 20.VII.30 (E. R. Tinkham).

I had previously misidentified this species as *purpuraria* B. & McD.; hence my erroneous reference in the original description of *graciella* (1940, Can. Ent., LXXII, 91).

Genus *Gabriola* Tayl.

Of the two described species in this genus, *dyari* Tayl. has the primaries of a deep brown color with a large suffused white spot at the anal angle and a strong outward bend of the t. p. line above the inner margin; it has been figured in the Report of the Brit. Col. Prov. Mus. for 1918, Pl. II, fig. 2. It was described from Vancouver Is. specimens and a paratype is in the Canadian National Collection; among other specimens from this region are two bred from *Tsuga heterophylla* by H. B. Leech; we also have a series from Kaslo, B. C., and a single specimen from Del Norte Co., Calif., (W. Bauer).

Minima Hlst. lacks entirely the brown shades on the primaries, the color being of a deep smoky gray; there is also little evidence of a white spot above anal angle; it was described as a *Nacophora* from Colorado and there are three specimens from Estes Park (Sperry) in our collection, one of which has been compared with the type, recently examined, by Mr. T. N. Freeman. *Bidisata* Dvar from Williams, Ariz., was referred in the B. & McD. 'Contributions' III, 184 as a synonym of this species.

Two other rather similar species before me are apparently undescribed.

Gabriola regularia n. sp.

Primaries of the same, brown shade as *dyari* but rather paler, due to white sprinkling in basal, median, and terminal areas. Cross-lines black, much as in *dyari* but the outward bend of the t. p. line above inner margin is practically lacking and this line shows none of the fine crenulations often found in Taylor's species. There is no prominent white patch above anal angle but the s. t. line is feebly indicated by a diffuse, pale, obsolescent shade, more or less parallel to outer margin; the dark dentate shade bordering inwardly the s. t. line of *dyari* below costa is lacking. Secondaries rather deep smoky, somewhat paler terminally with the maculation obscure. Beneath deeper in color than *dyari*. Expanse 27 mm.

Holotype—♂, Sta. Catalina Mts., Ariz., Aug. 20, 1938 (O. Bryant); No. 5570 in the Canadian National Collection, Ottawa.

Allotype—♀, same data.

Paratype—1 ♀, same data, Aug. 15.

Gabriola sierrae n. sp.

Primaries of a deep smoky, almost black shade, deeper in color than *minima* but more heavily peppered with white especially in the median area. Cross-lines black, much as in *minima* but closer together, the median space in consequence being narrower; heavy blackish shades preceding the t. a. and following the t. p. line. The most characteristic feature is a diffuse irregular, white, s. t. line, expanding above anal angle to an elongate blotch. Secondaries whitish, rather heavily peppered with smoky, with dark discal dot, traces of a median line and an irregular subterminal band. Beneath white, lightly peppered with smoky; primaries with large smoky, preapical, costal patch, a discal spot and an obsolescent t. a. line; secondaries with well defined, curved, dark median line, running through the discal spot and a subterminal band, largely confined to dark blotches on costa and at anal angle. Expanse 28-30 mm.

Holotype—♂, Mammoth Camp, Mono Co., Calif., Aug. 4, 1942 (W. P. Medlar); No. 5571 in the Canadian National Collection, Ottawa.

Paratypes—2 ♂, same data, Aug. 2, 4.

Euchlaena milnei n. sp.

Superficially resembling *E. sirenaria* Stkr. in general coloration. Head, thorax and abdomen light brown. The ground-color of the primaries is a pale yellowish but this color is only prominent in the costal half of the median area, the basal area and the inner half of the median area below the cubital vein being strongly shaded and speckled with a rather bright brown; the subterminal area beyond the t. p. line is entirely deep brown and the terminal area deep purplish with the exception of characteristic pale yellow subtriangular patch at apex of wing. The t. a. line is brown and shows a strong outward angle on the cubital vein, a very characteristic feature, the costal section being very oblique outwardly and the lower portion equally oblique inwardly to a point on inner margin one-fourth from base. Beyond the angle of the t. a. line the cubital vein and its two branches are outlined in brown as far as t. p. line. In the inner section of the median area there is a suffused median line visible, the section between this and the t. p. line being somewhat less suffused with brown than the basal section. A very fine dark discal dot is present. The t. p. line is feebly rounded and much as in *sirenaria*. An s. t. line is indicated by the difference in color-shades between the subterminal and terminal areas and shows an outward bulge between veins 4 and 6. Margin of wing angled at vein 4 as in *sirenaria*; fringes dark brown. Secondaries with basal half of wing yellowish, strongly suffused with brown; a well defined, heavy, median shade bisects this area and beyond it a small discal dot is visible. T. p. line as on primaries, connected at both ends outwardly to a smoky looped line, the intervening space filled with brown. Terminal area brown, mixed with purplish opposite cell. Margin of wing with a single fairly

deep excavation between veins 4 and 6; fringes dark. Beneath with the maculation of the upper side repeated but the areas basad of the t. p. line paler and with less of the brown suffusion.

Holotype—♂, Mountain Lake, Va., 23.VII.40 (L. J. and M. J. Milne); No. 5567 in the Canadian National Collection, Ottawa.

I take pleasure in naming this striking species for Dr. L. J. Milne, the collector and a former member of our Division staff. The species appears to be rare but I believe I examined another specimen years ago from the Sperry collection.

A SIMPLE METHOD OF MOUNTING APHIDS ON MICROSCOPE SLIDES

BY J. B. MALTAIS

Dominion Entomological Laboratory,
St. Jean, P. Q.

All stages of aphids and many forms of soft bodied insects can be successfully preserved whole in microscopical mounts provided the specimens are prepared according to methods based on suitable technique. Leading works on the subject, notably those by Kingsbury and Johannsen (4), Eltringham (1), Lee (5), and Kennedy (3), deal essentially with principles, formulae, and processes applied mostly to histological studies with some reference to entomological technique. Kennedy's work is perhaps the most complete and useful guide for entomologists. It deals entirely with methods for the study of the internal anatomy of insects, including processes for the preparation of whole mounts. Aphids are very delicate insects which require careful handling in preparation for permanent reference collections. Ordinary methods similar in most respects to those used by Hottes and Frison (2) were employed with little success by the writer. With the application of principles of histological technique, known processes were co-ordinated in a specific method so as to prevent some of the common defects likely to occur in the preparation of whole mounts of aphids.

The method described in this paper is divided into five successive operations, namely, preservation, dehydration, clearing, pre-mounting and mounting.

Preservation. Aphids collected in the field are placed directly in small vials half filled with the following preserving solution:

Cane Sugar	10 grams
Formaldehyde	5 cc.
Glacial Acetic acid	2 cc.
Water	83 cc.
Vatsol OT (wetting agent)	5 drops

This solution will fix and preserve all stages of aphids in excellent condition for several months and possibly longer without hardening the delicate tissues of the insects and without fading the colour markings of the body.

Dehydration. By means of a small camel-hair brush, the specimens are transferred from the preserving solution to Syracuse watch glasses and run through the dehydration process in the following order:

70% ethyl alcohol	15 minutes
95% ethyl alcohol	10 "
Absolute alcohol	5 "

Clearing. Transfer the pieces from absolute alcohol to carbo-xylol, (pure carbolic acid crystals, 1 part; xylol, 3 parts by volume) for 12 hours or longer depending on the degree of clearing desired. The most convenient and satisfactory method of making transfers is to drain off each time the liquid in the Syracuse glass with a medicine dropper, or a fine pipette, and replace it with the reagent which follows in the processes of dehydration and clearing. This operation will prevent injury which often results from moving material from one dish to another.

Pre-mounting. From the clearing solution each specimen is transferred separately into a very thin and fluid mixture of Canada balsam and carbo-xylol. It is necessary to puncture the abdomen of larger specimens with the point of a fine needle or insect pin when the transfer into the thin balsam mixture is being made. The pre-mounting treatment prevents shrinking and the formation of empty spaces or bubbles in the legs, antennae, or other parts of the insect body. The dilute pre-mounting mixture assures the rapid and complete infiltration of balsam in all parts of the specimens before they are placed into the mounting medium. It is apparently the lack of balsam infiltration which often causes shrinking and other defects.

Mounting. Mounting the specimens in Canada balsam is effected in the ordinary way, with a sufficient amount of medium for each mount depending on the size of the cover glass used. The mounting medium should be of such consistency as to keep from spreading too freely on the glass slip when the specimens are finally placed and spread in it immediately before laying down the cover glass.

In order to prevent the crushing and the displacement of the pieces usually caused by a considerable reduction in volume of the mounting medium when drying, the writer has used with success ordinary circular cover glasses, 15 mm. in diameter, especially modified to provide sufficient clearance between the glass slip and the cover glass. The clearance was obtained by bending down the edges of the cover glass at three equidistant points so as to make it stand on a sort of tripod for a clearance of about one-half millimeter. To perform this simple modification, the edge of a circular cover glass at any given point was heated in an alcohol flame and the heated area lightly pressed with the side of a steel needle to form a small downward fold. Three equidistant folds or legs thus obtained make the cover glass stand away from the surface of the glass slip. This forms a shallow cell in which the mounted specimen keeps its shape and position during the critical period of slow drying of the mounting medium.

The above method was especially developed for whole mounts of winged and wingless aphids on microscope slides. It may also be used with success for whole mounts of other small insects and morphological parts of various kinds. The tripod cover glass would in many cases replace with advantage glass rings for whole-mount cells.

Vatsol OT, a liquid wetting agent, is a product of the American Cyanamid Company, Niagara Falls, N. Y.

LITERATURE CITED

1. Eltringham, 1930. Histological methods for entomologists. Oxford University Press, New York.
2. Hottes and Frison, 1931. The plant lice, or Aphidae of Illinois. Bull. Illinois Nat. Hist. Surv., 19:121-447.
3. Kennedy, 1932. Methods for the study of the internal anatomy of insects. Ohio State University, Columbus, Ohio.
4. Kingsbury and Johannsen, 1927. Histological technique. John Wiley & Sons, Inc. New York.
5. Lee, 1928. The Microtometist's Vade Mecum, Edition IX, P. Blakiston's Son and Co. Philadelphia, Penn.

THREE NEW SPECIES OF NEARCTIC *DERONECTES* (COLEOPTERA, DYTISCIDAE) *

BY HUGH B. LEECH,

Vernon, British Columbia.

***Deronectes spenceri* n. sp.**

A large, finely punctate, vittate species having the facies of a giant form of *D. griseostriatus* (Degeer), and to a lesser degree resembling very large specimens of *Hygrotus unguicularis* (Crotch). Readily distinguished from the described Nearctic *Deronectes* by the narrowly separated and nearly parallel metacoxal lines.

Male: Length 6.1 mm., width 3.0 mm. Elongate-oval, moderately convex. **Head** yellow, with an oval spot just inward and posterior to the clear area above each antennal insertion; midway between these black spots and the eyes, a blackish area pointed anteriorly, broader basally, adjacent to but not touching the eyes; apical segment of palpi blackish except at base; antennal segments 9 to 11 black except at extreme base, 8 blackish in outer two-thirds, 7 infusate in apical half, 6 infusate apically, 1 to 5 pale yellow. **Pronotum** pale yellow, anterior margin appearing narrowly black because of underlying black base of head; an irregular series of punctures paralleling anterior margin, black; a discal triangular piceous mark on each side of median line, with two small blackish marks laterad of these, basal margin narrowly black, a speckled area between it and the triangular marks. **Elytra** pale yellow, each with the suture and 8 vittae black. First (subsutural) vitta narrow, beginning at basal sixth (its apparent course anterior to that is caused by marks on the under surface of the elytron), turning outward fishhook-like before the elytral apex; vittae 2 and 3 twice as wide as 1, third fishhook-like apically; vittae 4, 5 and 6 broader than 1 but narrower than 2, fifth thickened before its narrow apex, 6 of irregular widths, its basal section slightly separated to form a humeral blotch; 7 broad basally, ending at the subapical broadening of 6; eighth very short, almost postmedian. Undersurface black, epipleura, legs (except pro- and mesotarsi dorsally, and apices of metatarsal segments), and apex of last ventral segment yellow.

Head with numerous fine shallow punctures and with scattered deeper (usually coarser) ones anteriorly and posteriorly; surface minutely reticulate. Pronotum with sparse, appressed, fine golden hairs; sculpture much as on head, deeper punctures more numerous and smaller; lateral marginal bead very narrow. Elytra sparsely clothed with fine, appressed, gold hairs; punctures a little smaller than those of pronotum; surface less distinctly microsculptured, a faint longitudinal series of coarser punctures on black vitta 3. **Undersurface** finely shagreened except for a few small areas on or near the median line; metacoxal plates with a few irregular, shallowly impressed lines. Prosternal process sagittate, sharp apically, arcuately convex in cross section, coarsely punctate laterally and pubescent; intercoxal carina terminating anteriorly in a slight prominence. Mesosternal ridge and tip of metasternum not in contact. First 3 protarsal segments dilated, about $\frac{3}{4}$ as broad as apical width of tibia; protarsal claws slightly sinuate, about as long as claw-bearing segment, the anterior one a little thicker and more curved than its fellow. Metafemur with a beard of fine golden hairs along posterior edge from before apex of trochanter to middle of length. **Metacoxal** lines narrowly separated, nearly parallel, the enclosed areas punctate and with erect hairs; metacoxal process triangularly incised apically at middle, the cavities beneath distinctly separated. Apparent sixth abdominal sternite impressed medially just before apex, the tip with a slightly produced lip. Aedeagus long, canalliculate apically on ventral side; incised at tip; slightly twisted in apical third (fig. 2). Parameres strongly chitinated.

*Contribution No. 2350, Division of Entomology, Science Service, Department of Agriculture, Ottawa, Ont.

Female: Very similar to the male, a little stouter. First 3 pro- and mesotarsal segments not quite as broad as in male; metafemora not bearded; impressed lines more evident on metacoxal plates; preapical impression of last sternite shallower.

Variation: The 188 paratypes vary in length from 5.5 to 6.0 mm., with a mean of 5.85 mm. Twenty-eight specimens show a tendency toward melanism, indicated by a broadening and coalescing of the elytral vittae, especially post-medially and disco-medially. The markings on the head and pronotum may be intensified or entirely absent, but these aberrations are not correlated with the darkening of the elytra. None of these color variations is sex-lined.

Holotype: ♂, 13 Mile Lake, Dog Creek Road, N. W. of Clinton, B. C. 11.X.43, Hugh B. Leech and Cecil V. G. Morgan; in the Canadian National Collection.

Allotype: ♀, same data.

Paratypes, 188, all topotypical. Seven collected on June 28, 1943, by G. J. Spencer, 42 collected on October 10 by Leech and Morgan; the rest taken on October 11. Paratypes will be distributed to the following museum and private collections: The Canadian National Collection; the British Museum; the United States National Museum; the California Academy of Sciences, San Francisco; Museum of Comparative Zoology, Cambridge, Mass.; Department of Zoology, the University of British Columbia, Vancouver; Drs. F. N. Young, F. Guignot, M. H. Hatch; Messrs. J. B. Wallis, H. P. Chandler, G. R. Hopping, J. W. Green, K. F. Chamberlain, C. A. Frost, G. Stace Smith, J. Balfour-Browne, and Prof. F. Balfour-Browne.

D. spenceri is most closely allied to *griseostriatus* (Degeer), but differs by its greater size, close and nearly parallel metacoxal lines, pre-apically impressed last abdominal sternite, and by the bearded metafemora and canaliculate aedeagus of the male. In Fall's key (1923, A revision of the North American species of *Hydroporus* and *Agaporus*, p. 99-100), it runs to *griseostriatus*, but the form of the metacoxal lines will distinguish it from any described Nearctic species.

The type locality is a small lake close to and on the right hand side of the Dog Creek Road, about 13 miles beyond where it leaves the Gang Ranch Road, north of Clinton, B. C. The lake has no official name, being variously referred to by the natives as 12 Mile, 13 Mile, or 14 Mile Lake. The shores of the lake are in part sandy or silted, in part rocky, the stones volcanic and full of irregular holes. The water is mineralized, clear, and at the time of our visit the only noticeable vegetation in it was a species of *Scirpus*. When Professor Spencer visited it in late June, he found the beetles running over the bottom about four feet from the margin; others could be seen further out. When Mr. Morgan and myself were there in October, the weather was dull and cold; the beetles had moved close to the shore and most of our specimens were taken within ten inches of the edge and in six inches or less of water. With the aid of a flash-light we watched some of them swimming around in company with *D. striatellus* (LeConte) but 95 per cent of them were semi-torpid, hiding in holes in the stones. Every stone and piece of water-logged wood picked out of the water had beetles or a ubiquitous notonectid bug (*N. kirbyi* Hangerford, det. W. Downes) tucked away in crannies on the underside. The bugs kept to themselves, choosing the larger holes and packing themselves in, head first, as tightly as sardines in a can. The *D. spenceri* had wedged themselves into other holes and cracks, while the little *D. striatellus* were in similar groups.

Deronectes titulus n. sp.

A large, elongate, dull, vittate species allied to and resembling *D. grammicus* Sharp; neither of these fit any of the choices in Fall's key (1923:99)

though belonging in the *eximius-corvinus* section on the basis of their rather broadly separated mesocoxae. *D. grammicus* and *titulus* are separable from all species recorded from North America north of Mexico by the densely punctate metatibiae.

Male: Length 5.7 mm., width 2.7 mm. Form oblong, subparallel, widest just behind middle of elytra. Head and pronotum reddish-yellow; head black at base and adjacent to eyes; pronotum black in anterior quarter adjacent to head, narrowly along base, with a broad extension on each side of median line from base to middle. Elytra yellow, each elytron with the suture and 6 vittae black. Sutural black stripe enlarged at base and apex; vitta 1 beginning near scutellar enlargement of sutural and vaguely joining its apical broadening; 2nd vitta beginning about on a level with 1st, coalesced ante- and postmedially with 3rd, which extends to base of elytron and is joined postmedially and preapically to 4th; 4th not reaching base; 5th enlarged laterally at elytral base, with large post-humeral and median lateral extensions passing the vague 6th and reaching more than half way to lateral margin. Undersurface rufous to piceous, antennae and palpi reddish-yellow.

Head finely evenly punctate, surface between punctures minutely reticulated. Punctuation of pronotum coarser and less evenly spaced than that of head, partially masked or obliterated by rugae at base and sides of pronotum, and slightly so adjacent to anterior series of coarse punctures; lateral marginal bead very narrow. Elytral punctuation finer than that of pronotum, deeper than that of head; there is a poorly defined stria along the outer margin of vitta 1, another along the inner margin of vitta 3, and the intervening space is slightly depressed; a few stria punctures show apically; there are indications of a stria along the outer side of vitta 3, and along the inner margin of vitta 5, the intervening area being vaguely depressed. Elytra with a few fine, depressed hairs. Undersurface shagreened, dull except along parts of median line, metacoxal plates and sides of first few abdominal sternites rugose. Prosternal process elongate, parallel-sided, blunt apically, margined laterally, depressed on each side of fine median longitudinal carina which ends anteriorly in an intercoxal prominence. Metacoxal lines diverging anteriorly, enclosed area densely punctate; metatibia densely punctate on outer face except at tip. Metacoxal processes slightly incised at median line, each with a small round tumidity at middle of posterior margin; metacoxal cavities separated by an exposed partition. Apparently 6th abdominal sternite (profile) scooplike, with an angle of nearly 45° between anterior margin and apex. Aedeagus shallowly, broadly canaliculate just before apex on dorsal side (fig. 3); parameres stout, strongly chitinized.

Female: Very like the male. Each elytron showing a short diagonal scutellar stria, and having striae 1 and 2 punctate nearly to base; striae 3 and 4 show punctures apically, and there are traces of a premarginal stria. The mesolegs of the allotype have been removed to show that the mesosternal ridge and the tip of the metasternum do not touch.

Remarks: All three specimens of the type series are damaged. The holotype lacks the outer 5 segments of the right antenna, the outer 8 of the left, the outer 4 segments of each anterior tarsus, the outer 2 of the right mesotarsus, the last 3 segments of the right metatarsus and the outer 4 of the left. The allotype has the basal segment of the right protarsus, but none on the left; one mesoleg lacks the tarsus. The paratype lacks all tarsi, and has only the basal segment of each antenna.

In the closely related *D. grammicus* Sharp, the female has protarsal segments 1 to 3 of nearly equal width; in the male 2 and 3 are half as broad again as 1, and the anterior tarsal claw is slightly longer than the outer one. These characters are probably very similar in *titulus*.

Holotype: ♂, Green Valley, Brewster Co., Texas, VII.26 (J. W. Green); in the U. S. National Museum.

Allotype: ♀, same data, in the U. S. N. M.

Paratype: ♂, topotypical. In my collection through the kindness of Mr. Green.

Deronectes titulus is closest to *grammicus* Sharp; males of the two are readily separated by the aedeagi (compare figs. 1 and 3). *D. titulus* is a larger, darker, more parallel-sided species with broader elytral vittae; it has reddish-yellow rather than yellow head and pronotum, and a more strongly modified last abdominal sternite.

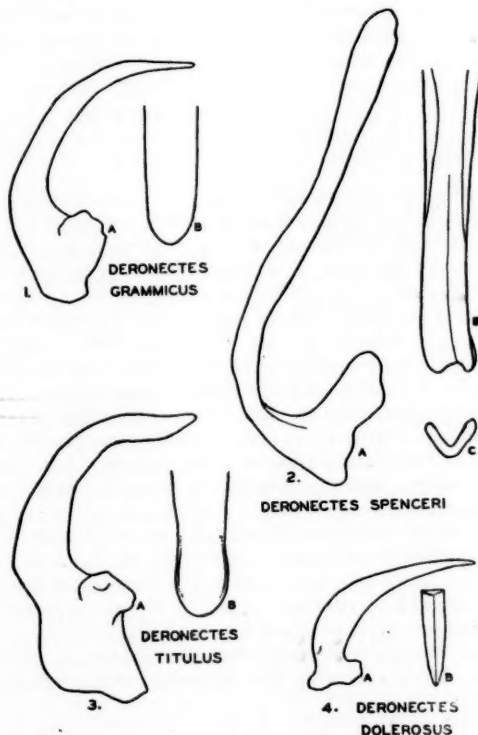


Fig. 1. *Deronectes grammicus* Sharp. A, aedeagus in profile; B, dorsal view, apical part of aedeagus.

Fig. 2. *Deronectes spenceri* n. sp. A, aedeagus; B, ventral view of apical part; C, end view, tip of aedeagus, ventral surface uppermost.

Fig. 3. *Deronectes titulus* n. sp. A, aedeagus; B, dorsal view of apical part.

Fig. 4. *Deronectes dolerosus* n. sp. A, aedeagus; B, dorsal view of apical part.

***Deronectes grammicus* Sharp**

Deronectes grammicus Sharp, 1887, Biol. Centr.-Amer., Coleopt. (Suppl.) 1 (2):754.

Sharp described this species from a single male collected by Hoge near the City of Mexico. My concept* of the species is based on two males and a female in my collection, taken by my friend Mel Embury at Durango, Dgo., Mexico, May 30, 1937. The description of *titulus* n. sp. applies well, except for the differences noted thereunder. Sharp refers to *grammicus* as "ferrugineus" in his latin

*Mr. J. Balfour-Browne has dissected the aedeagus of Sharp's type of *grammicus* and confirms my identification of the Mexican and New Mexican examples.

diagnosis, but in the remarks in English calls the head and pronotum "yellow"; I have been influenced by the latter description in my identification.

Recently Mr. J. B. Wallis has submitted for determination a pair of *grammicus* from Faywood, New Mexico, November 19, 1932 (R. T. Kellogg). They agree excellently with the Durango specimens. The aedeagus of a Durango male is shown in figure 1.

***Deronectes dolerosus* n. sp.**

A black, pubescent species, allied to and resembling *funereus* (Crotch) and *striatellus* (Leconte).

Male: Length 4.8, width 2.7 mm. Form broadly ovate, moderately convex; dorsal surface alutaceous, elytra clothed with fine, appressed, yellowish pubescence, pronotum with only a few such hairs; ventral surface opaque, basal abdominal sternites more shining at middle. Head black, a small yellowish spot at middle of base; pronotum and elytra black; first four antennal segments yellowish, five to eleven progressively more tinged with black; terminal palpal segment black; pro- and mesolegs brownish-black, tarsi black; trochanters, and bases only of metafemora, reddish-brown; part of inflexed portion of pronotum yellowish-brown; prosternal process, metasterna, metacoxae, and abdominal sternites black, epipleura vaguely paler.

Head slightly more than two-thirds width of pronotum at base, shallowly impressed at each side just anterior to and inward from eyes; surface densely punctate, with scattered larger punctures, smaller ones separated by their own widths or less. **Pronotum** widest just anterior to base, sides evenly arcuate, anterior angles bluntly acute, posterior angles obtuse; lateral marginal bead slightly broadening posteriorly, about one-third as wide as a median antennal segment; surface finely alutaceous between punctures, which are a little sparser than those of head; usual transverse series of coarser punctures paralleling anterior margin and along each side of base; inwards from each marginal bead, surface is opaque, with a few diagonal impressed lines. Each *elytron* with the following striae: a short oblique scutellar, a sutural, two discal and a vague prehumeral, these last three only feebly or not at all impressed; elytral punctation finer and denser than that of pronotum. **Prosternal** process clothed with yellow hairs, lanceolate, with longitudinal median carina which begins anteriorly in a protuberance between the coxae; meso- and metasterna not meeting on median line between mesocoxae; metasterna, metacoxal plates, and abdominal sternites, except basal ones medially, densely and minutely subgranulose, opaque; metasterna with a reticulated shiny area near middle. First three segments of pro- and mesotarsi broadly dilated, almost as wide as apex of a protibia; each anterior protarsal claw a little wider medially and more abruptly bent apically than its mate. Aedeagus as in figure 4.

Female: Very similar to the male; pro- and mesotarsi narrower.

Holotype: ♂, Coalinga, California, March 5, 1937 (H. B. Leech). No. 5455 in the California Academy of Sciences, Entomology.

Allotype: ♀, Same data as holotype. No. 5455 in the California Academy of Sciences.

Paratypes: 5 ♂, 1, Fresno, California, March 4, 1937 (Hugh B. Leech); 1, San Francisquito Canyon, Ventura Co., California, March 24, 1929 (Michener); 3, Piru Creek, Piru, Ventura Co., California, June 29, 1939 (B. E. White). Paratypes will be distributed as follows: 1 to the Canadian National Collection, Ottawa; 1 to the British Museum; 3 in my collection.

The paratype from Fresno has more pubescence on the pronotum than is usual; in all but the Fresno example the first discal elytral stria is slightly further from the sutural than the latter is from the suture.

Deronectes dolerosus n. sp. is most closely allied to *funereus* (Crotch) and *striatellus* (LeConte); dark examples of *aequinoctialis* Clark have a super-

ficial resemblance, but they have only one discal elytral stria, which is twice as far from the sutural as the latter is from the suture. The following adaptation of couplet 9 of Fall's key (1923:100) will separate the three allied species.

9. Outer discal elytral striae feeble and more or less indistinct and incomplete; prosternal intercoxal carina terminating anteriorly in a distinct prominence; male pro- and mesotarsi broader than in female.....9 A.
- Outer discal striae nearly as distinct and complete as the inner ones; lateral margin of pronotum not appreciably wider posteriorly; prosternal intercoxal carina not terminating anteriorly in a prominence; pro- and mesotarsi of male very little wider than those of female. Elytral coloration varying from almost entirely yellowish to entirely black. Smaller species, 3.5 to 4.5 mm. long *striatellus*
- 9A. Side margin of pronotum gradually widening from apex to base, where it is at least half as wide as a median antennal segment; pronotum with longitudinal rugae at sides and base, surface shiny between the punctures, which are irregular in size and distribution and much larger than those of elytra. Mesosternal ridge and tip of metasternum in contact (mesocoxae must be removed to verify this character). Elytra usually maculate. Larger and more robust species, 5 to 5.5 mm. long *funereus*
- Side margins of pronotum only slightly wider posteriorly; pronotum with few or no rugae, surface often reticulated between the punctures which are evenly distributed and only a little larger than those of elytra. Mesosternal ridge and tip of metasternum not in contact. Elytra black. Smaller species, 4.5 to 4.9 mm. *dolerosus*

It is interesting that *funereus* and *dolerosus* differ as to the contact of the mesosternal ridge and the tip of the metasternum, a character used to separate *Deronectes* from *Hydroporus* by Sharp. Otherwise they are so much alike that I have been tempted to consider *dolerosus* a northern subspecies of *funereus*.

BOOK NOTICE

College Entomology, by E. O. Essig, Professor of Entomology and Entomologist, Agricultural Experiment Station, University of California. New York, The Macmillan Co., 900 pages, 308 illustrations. Published by the Macmillans in Canada. Price \$5.00.

As stated in the preface, in the preparation of the text "the author has sought to furnish the essential facts about insects with which every well-informed person should be familiar". Chapter I discusses the "Metamorphosis of Insects", Chapter II, the "Anatomy of Insects", Chapter III, the "Classification of Insects" and the remaining 33 chapters treat of the various orders of insects as recognized by the author. Certainly much effort has been directed to all of these discussions. Whether entomologists in general will agree with Professor Essig's advanced viewpoint is, it seems to the writer, a matter for investigation by specialists concerned in the various groups. In any event we should be grateful to the author for the completion of a book of this character. It should find a place in every laboratory where a reference text is of value. It certainly contains a wealth of information. In such an extensive publication doubtless errors will be found. The author would appreciate data regarding the same whenever noted.

Arthur Gibson

AMPHOROPHORA STUDIES*

BY G. F. KNOWLTON AND M. W. ALLEN, †

Logan, Utah

A number of species have been described as new from the West since the publication of Mason's revision of the genus *Amphorophora* (Proc. U. S. Nat. Mus. 67:1-92, 1925). To make clear the characters and relationships of some of these aphid species, and particularly those which infest berry crops, the present key has been prepared. Included are the species of *Amphorophora* known to occur in Utah; in addition are a few berry-infesting species not yet found in this state. The writers consider *Amphorophora aridus* K. to be a synonym of *A. grindeliae* (Will.) *A. accidentalis* K. was originally described from an alate male rather than from an alate female. Brief descriptions of the *Amphorophora* species infesting *Ribes* are given, including an apparently undescribed species from *Ribes petiolaris*; also one from *Rubus parviflora*.

KEY TO ALATE VIVIPARA

- A. Cornicles distinctly reticulated.
 - B. Rostral IV + V shorter than base of antennal VI *crystleae* S.-K.
 - BB. Rostral IV + V longer than base of antennal VI.
 - C. Rostral IV + V exceeding 0.16 mm. long.
 - D. Sensoria in alate fewer than 30 *rubicola* (Oest.)
 - DD. Sensoria in alate more than 30 *arnicae thatcheri* K.-A.
 - CC. Rostral IV + V not exceeding 0.16 mm.
 - D. Cornicles exceeding antennal III *bonnevillea* K.-A.
 - DD. Cornicles not exceeding antennal III.
 - E. Antennal IV equal to cornicles *goldamaryae* K.
 - EE. Antennal IV shorter than cornicles *masoni* (K.)
- AA. Cornicles not distinctly reticulated.
 - B. Sensoria present on antennal IV.
 - C. Sensoria present on antennal V.
 - D. Antennal IV with fewer than 20 sensoria *sonchi* (Oest.)
 - DD. Antennal IV with more than 20 sensoria *sensoriata* Mason
 - CC. Sensoria not present on antennal V.
 - D. Sensoria on antennal III exceeding 30.
 - E. Cornicles distinctly swollen, greatest width exceeding 0.08 mm. *petiolaris* n. sp.
 - EE. Cornicles not so swollen, greatest width less than 0.08 *nigricornis* K.
 - DD. Sensoria on antennal III not exceeding 30 *grindeliae* (Will.)
 - BB. Sensoria not present on antennal IV.
 - C. Cornicles longer than antennal III.
 - D. Cornicles moderately swollen, greatest width about 0.1 *halli* K.
 - DD. Cornicles slightly swollen, greatest width less than 0.08.
 - E. Antennae and tibiae entirely black *janesi* K.
 - EE. Antennae and tibiae not entirely black *nervata* Mason
 - CC. Cornicles not longer than antennal III.
 - D. Hind tarsi longer than base of antennal VI.
 - E. Sensoria exceeding 50 on antennal III *rubicumberlandi* K.-A.
 - EE. Sensoria not exceeding 50 on antennal III *ribiella* (Davis)
 - DD. Hind tarsi not longer than base of antennal VI.

*Contribution from the Department of Entomology, Utah Agricultural Experiment Station.

†Research associate professor and former graduate research assistant.

- E. Cornicle not exceeding 0.65 mm.
 F. Sensoria present on antennal III in
 aptera *ribiella* (Davis)
 FF. Sensoria absent on antennal III in
 aptera *crataegi* (Mon.)
 EE. Cornicle exceeding 0.65 mm.
 F. Rostral IV + V, 0.14 to 0.15 mm. *rubi* (Kalt.)
 FF. Rostral IV + V, 0.19 mm.
 G. Sensoria exceeding 40 on antennal
 III *utahensis* n. sp.
 GG. Sensoria not exceeding 40 on
 antennal III *tigwatensa* H.

***Amphorophora nigricornis* Knowlton**

(Figures 1-3, 8)

Knowlton, Pan-Pacific Ent., 3:185, 1927.

Alate vivipara: Color, legs dusky except proximal one-half of femur; cornicles with distal one-half dusky; body 1.3 to 1.8 mm. long; width of head through eyes, 0.47 mm.; antennae, 2.48 to 3.17, dark entire length; antennal III, 0.69 to 0.92 with 50 to 53 slightly tuberculate sensoria; IV, 0.32 to 0.54 with 5 to 8 sensoria; V, 0.32 to 0.45; VI, 0.08 to 0.11 plus 0.84 to 1.12; rostral IV + V, 0.14 to 0.16, slenderly obtuse; hind tibia, 1.66 to 2.15; hind tarsi 0.1 to 0.13; cornicles 0.45 to 0.59, greatest width 0.05 to 0.07, least width 0.04 to 0.05; cauda 0.28 to 0.3 mm., dusky.

Collected at Kaysville, Utah, June 9, 1938, on black currant (G. F. Knowlton); Nibley and Providence, Utah, September 19, 1938, on yellow currant (Knowlton).

Taxonomy: This species runs to *A. sonchi* (Oest.) in Gillette and Palmer's key (Ann. Ent. Soc. Am., 27:135, 1934) from which it differs in having fewer sensoria on antennal IV, no sensoria on antennal V, longer cornicles and dusky legs. It differs from *A. ribiella* (Davis) in having sensoria on antennal IV.

***Amphorophora osborni* Knowlton**

Knowlton, Pan-Pacific Ent., 18:143, 1942.

Apterous vivipara: Color green; body 2.1 mm. long; antennae 2.41, pale except distal ends of III, IV, V, and all of VI which are blackish; antennal III, 0.75 to 0.8 mm. long with 36 to 37 sensoria; IV, 0.448, without sensoria; V, 0.496; VI, 0.128 + 0.86 (= ends broken off); rostral IV + V, 0.16 mm.; hind tibiae 1.46; hind tarsi 0.13; cornicles pale, 0.87 long, slightly swollen on distal half; cauda pale, 0.34 mm. long, with 3 or 4 hairs on each side of distal one-half.

Collected on foliage of black currant, *Ribes longiflorum*, at Cedar City, Utah, June 15, 1935 (Knowlton).

Amphorophora osborni has more sensoria on antennal III, and its cornicles are longer than those of *A. ribiella* (Davis), *A. nabali* (Oest.) and *A. pergandei* Mason.

***Amphorophora petiolaris* n. sp.**

(Figures 6-7, 9-11, 13-14)

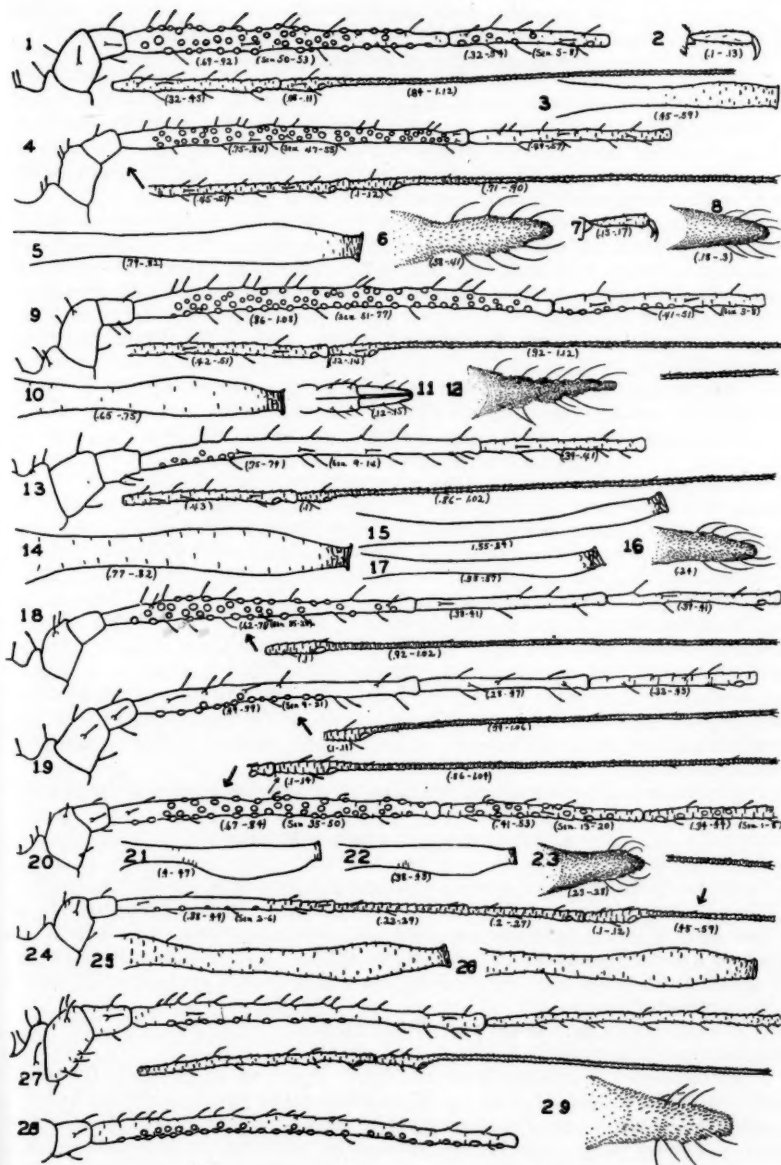
Alate vivipara: Color, antennae and tibiae dark, cornicles dusky; body 2.15 to 2.66 mm. long; antennae, 3 mm.; antennal III, 0.86 to 1.08 with 51 to 77 sensoria; IV, 0.41 to 0.51 with 3 to 8 sensoria; V, 0.42 to 0.51; VI, 0.12 to 0.14 + 0.92 to 1.12; rostral IV + V, 0.12 to 0.15, barely reaching second coxae; hind tibiae 1.74 to 2.25; hind tarsi, 0.15 to 0.17; cornicles 0.65 to 0.75, greatest width 0.1, least width 0.05 to 0.06, not distinctly reticulated; cauda 0.38 to 0.41 mm. long.

Collections: Type and paratypes on *Ribes petiolare*, June 25, 1938 at Condonully, Washington (Wm. W. Baker). Type in the U. S. National Museum.

Taxonomy: This species runs to *A. sonchi* (Oest.) in Gillette and Palmer's key (Annals Ent. Soc. Amer., 27:135, 1934) from which it differs in having;

petiolaris
(Davis)
tigwatensa

PLATE III.



SPECIES OF AMPHOROPHORA

Amphorophora nigricornis Knlt.: Alate, 1-3, 8. *A. utahensis* n. sp.: Alate, 4-5. *A. petiolaris* n. sp.: Alate, 6-7, 9-11; Apterous, 13-14. *A. bonneville* K.-A.: Alate, 12. *A. ribiella* (Davis): Alate, 16-18; Apterous, 15, 19. *A. sonchi* (Oest.): 20-21, 23; Apterous, 22, 24. *A. gwatensa* Hottes: Alate, 26, 28-29; Apterous, 25, 27.

cornicles longer, fewer sensoria on antennal IV with none on V, and longer cauda. From *A. nigricornis* K. it differs in having longer cornicles, more sensoria on antennal III, and cornicles more distinctly swollen. *A. petiolaris* has fewer antennal sensoria and longer cornicles and cauda than *A. braggi* Mason.

***Amphorophora ribiella* (Davis)**

(Figures 15-19)

Davis, Canad. Ent., 51:231, 1911, *Macrosiphum*.

This aphid is common on black and yellow currants over the entire state of Utah and has been collected from many localities.

Color: Yellow green to green; antennals I, II, III, and VI and tips of IV and V dusky; legs, cornicles and cauda pale.

Collections: On *Ribes longiflorum* and *R. aureum*, currants, in Utah at New Castle, Parowan, Enterprise, June 15, 1935; Cove, Hyde Park and Logan September 8, 1938; Lewiston, October 11, 1938 (Knowlton); West Weber, Taylor, Providence and Roy, September, 1938 (Knowlton-F. C. Harmston); Santa Clara and Washington, June 16, 1935 (Knowlton); Farmington, September 17, 1941 (Knowlton-W. D. Fronk); also at Twin Falls, Idaho, August 19, 1943 (Knowlton).

Taxonomy: *A. ribiella* differs from *A. sonchi* and *A. nigricornis* in lacking secondary sensoria on antennals IV and V in the alate.

Less common on black currant in Utah than *A. ribiella*.

***Amphorophora sonchi* (Oestlund)**

(Figures 20-24)

Oestlund, Minn., Geol. and Nat. Hist. Surv., 14th Rept., p. 34, 1886, *Rhopalosiphum*.

Less common on black currant in Utah than *A. ribiella*.

Color: Apter, yellowish green to green; alates with abdomen yellowish-green; antennae dark except base of III in alate; pale to dusky in aptera. Cornicles and cauda dark.

Collections: Alate vivipara, Lewiston, September 26, 1935; Midvale, October 15, 1938; Salt Lake City, October 5, 1938; Smithfield, October 11, 1938. Apterous ovipara and alate males, Collinston, November 7, 1929; Fielding, Garland, and Logan, October 1929, in Utah. All collections on black currant, *Ribes longiflorum*, and yellow currant, *R. aureum*. Also on *Ribes* at Logandale, Nevada, April 26, 1935 (Knowlton); Livingston, Montana (H. F. Thornley), on wild raspberry.

Taxonomy: This species differs from *A. sensoria* Mason in having fewer sensoria on the antennal joints.

***Amphorophora utahensis* n. sp.**

(Figs. 4-5)

Alate vivipara: Color green, legs and cornicles slightly dusky; body 1.53 to 1.9 mm. long; antennae 2.75 to 2.95, only slightly dusky; antennal III, 0.75 to 0.84 with 47 to 55 sensoria scattered over entire segment; IV, 0.49 to 0.57, without sensoria; V, 0.45 to 0.51; VI, 0.1 to 0.12 + 0.71 to 0.9; rostral IV + V, 0.17 to 0.2; hind tibiae 2.05 to 2.3; hind tarsi, 0.08 to 0.1; cornicles 0.79 to 0.82; cauda constricted.

Collections: On *Rubus parviflora*, Ogden, Utah, June 4, 1937 (G. F. Knowlton and C. F. Smith).

Taxonomy: *Amphorophora utahensis* runs to *A. nabali* (Oest.) in Mason's key (U. S. Nat. Mus. Proc., 67:6, 1925) from which it differs in having no sensoria on antennals IV and V. This species differs from *A. tigwatensa* Hottes in having more sensoria on antennal III and shorter antennal segments; differs from *A. rubi* (Kalt.) in having shorter antennal joints and longer rostral IV + V.

***Amphorophora tigwatensa* Hottes**

(Figures 25-29)

Winged and wingless specimens were collected near the top of Cameron Pass, Colorado, beside highway on wild raspberry, August 21, 1940 (G. F. Knowlton).

THE GRASSHOPPER OUTBREAK OF 1944 IN BRITISH COLUMBIA*

BY E. R. BUCKELL,
Kamloops, B. C.

During 1944 one of the worst and most widespread grasshopper outbreaks in the history of British Columbia was in progress. From the Bulkley and Nechako Valleys south through the cattle ranges of the Chilcotin, and over the whole of the southern interior and the Kootenays, grasshoppers were present in outbreak numbers. In some areas they had been more numerous in 1943 and were on the decline, while in other sections they were still on the increase, but everywhere they were present in damaging numbers.

In British Columbia grasshoppers have a fairly regular cycle of abundance and scarcity, with the peak years being about seven years apart, and with the different geographical areas, such as the Okanagan, Nicola, Chilcotin and certain other areas, usually having different dates for their peak years. This means that we seldom have the whole province heavily infested at any one period and, furthermore, many cycles of abundance show only a slight increase in numbers over the low or "normal" and pass unnoticed and with little damage to crops reported. This was the case, for instance, in the North Okanagan Valley, where, prior to 1943, a period of some 20 years passed without any very noticeable increase in the number of grasshoppers present. Never before, since entomologists have made a study of the various grasshopper species in this province, has an outbreak quite like that of 1944 been encountered.

In former outbreaks a number of species have usually shown an increase with one or two predominating, but in the 1943-44 outbreak one species, *Melanoplus mexicanus* (Saussure), the lesser migratory grasshopper, was entirely responsible for the outbreak with little aid from other species and had, furthermore, increased to such incredible numbers from one season to the next as to constitute little short of a biological phenomenon the like of which entomologists in British Columbia have never before been privileged to witness. This species is known to be the most injurious grasshopper in the northern United States and Canada, and the great outbreaks of 1874, when the Rocky Mountain locust, as it was called in those days, devastated northwestern United States from Montana through the Dakotas to Minnesota and thence into the Canadian Prairies, is still one of the landmarks in American entomological history.

During the past twenty years grasshoppers have become increasingly numerous in some sections of British Columbia, especially on some of the cattle ranges of the dry interior, and control zones have been formed by the landowners in these areas for their control. Until 1943, the activities in these control zones were mainly concerned with the clear-winged grasshopper, *Camnula pellucida* (Scudder), and had maintained excellent control, and the areas had sustained only insignificant losses. This was possible because the clear-winged grasshopper is an easy species to combat; congregating in small areas for egg-laying, hatching over a short period, dying off early, feeding only on grains and grasses, and taking poisoned bait freely, it was also kept down by a fungus disease in damp seasons. In the Nicola Control Zone remarkable control had been maintained for this species, using a diesel oil spray on the egg-beds at hatching time and later using poisoned bait spread by mechanical bait spreaders for the control of the adults.

In 1943 and 1944 the clear-winged grasshopper was remarkably scarce, fungus disease having almost wiped it out for several years previously; but the sudden unprecedented increase of *M. mexicanus* (Saussure), always a common species in warm locations, entirely upset even the best of organized control zones. The control organizations were faced with a new enemy with new habits and the power to increase to incredible numbers, almost as it seemed overnight, and which spread out from its usual habitats and invaded the highest of the cattle

*Contribution No. 2340, Division of Entomology, Science Service, Department of Agriculture, Ottawa, Canada.

range areas where it had never before been recorded in numbers. It was found to be exceedingly hard to control because it had no defined egg-beds, hatched over a very long period, was active until late in the season, would eat almost anything, and would not take poisoned bait at all freely, and was not killed by fungus.

The present devastating outbreak of *M. mexicanus* will pass into history in a year or so and British Columbia will be again faced with periodical outbreaks such as have previously occurred, composed mainly of the clear-winged grasshopper, and which have repeatedly been controlled by the formation of control areas in which annual control measures prevented the build-up of outbreaks.

During the summer of 1944 sarcophagid parasites began to build up rapidly in areas where the grasshoppers had been plentiful for two years or more; they took a big toll of the adults before they had laid their eggs, and it is believed that in these areas there will be a marked reduction in the numbers of grasshoppers present in 1945. It is interesting to note that the enormous increase in the numbers of *mexicanus* in 1943 and 1944 resulted in a species of sarcophagid parasite, previously rare in British Columbia, becoming very numerous in 1944, and it is due to the presence of this fly, *Sarcophaga kellyi* Ald. and some of its close allies, that there is reason to hope that the outbreak of this species will soon be terminated.

OBITUARY

On October 17, 1944, Dr. Maria Bogzhowska wrote to the writer, from Lyon, France, informing him of the death of Dr. Stanislaw Minkiewicz, at Pulawy, Poland, on February 2, 1944. The announcement did not reach Ottawa until December 26.

Dr. Minkiewicz was well known to members of the Entomological Branch of the Dominion Department of Agriculture, particularly those resident at Ottawa. The writer first met him in 1927, when he visited our home. In that year he spent several months in the United States and Canada, during which period he visited many institutions where entomological work was in progress. Later, in 1935, members of the family saw a good deal of him while attending the World Congress of Entomology at Madrid, Spain, and in 1938, at a similar congress held in Berlin, Germany.

Dr. Minkiewicz, as chief entomologist at the Agricultural Institute, in Pulawy, made important contributions to entomology, not only in the training of students, but also as an investigator of insect pests in Poland, such as the codling moth, the European apple sucker, and other destructive fruit insects.

Dr. Minkiewicz was a kindly man, one who made friends easily and for his personal qualities alone he will not soon be forgotten. His son, Joseph, whom we also knew died, we were informed, in a concentration camp in 1942. To Mrs. Minkiewicz we extend our sincere sympathy.

Arthur Gibson.

Mailed, Friday November 2, 1945.

GUELPH PRINTING SERVICE

nd
ned
ost
by

ory
ut-
ged
of
ut-

up
or
t is
of
in-
of
ery
ld.
his

om
at
twa

nch
Ot-
hat
ich
ess.
ing
ilar

in
g of
ing

for
eph,
942.

on.